REMARKS

Claims 41-51 were pending. Claims 45 and 50-51 have been amended. Claims 52-60 are new. Claims 41-60 are pending.

Claims 41-51 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Pat. No. 6,709,874 to Ning. Applicants respectfully request reconsideration of this rejection.

Claim 41 recites a magnetic random access memory (MRAM) structure including, *inter alia*, "a longitudinally extending planarized conductive line formed within an insulating layer," and "an electroplated bottom sense layer formed over said conductive line."

Ning discloses an MRAM structure having a magnetic stack 222 that includes a bottom metal stack, a thin dielectric layer, and a top metal stack. The bottom metal stack includes a plurality of metal layers deposited over a conducting layer. The thin dielectric layer and the top metal stack are deposited over the bottom metal stack, and the layers are patterned and etched to form the magnetic stacks 222. Ning does not disclose a MRAM structure including "an electroplated bottom sense layer."

The Office Action asserts that the bottom metal stack of Ning could be formed by electroplating. This is not the point. The question is does the reference teach or suggest an electroplated layer. Ning does not. The bottom metal stack of Ning includes a plurality of metal layers. Typically four to eight layers are used. The metal layer materials include PtMn, CoFe, Ru, and NiFe. Ning states that these layers are deposited by various techniques including physical vapor deposition (PVD), evaporation, ion sputtering, and chemical vapor deposition (CVD). Ning further

teaches that because each layer is very thin, most <100 Angstroms, PFD is the preferred method of deposition. See col. 6, lines 49-65.

Ning does not teach or suggest that the several layers of different metal materials making up the bottom metal stack are formed by electroplating. The Office Action points to the description in col. 6, lines 35-38 as allegedly teaching that the bottom metal stack layers are electroplated. Applicants respectfully disagree.

Applicants note that the description in Ning being relied upon relates to formation of the metal cap layer 220, not to formation of a bottom sense layer as claimed. Specifically, Ning teaches that "first metal cap layer 220 may be deposited by PVD, CVD, or may be electroless-plated and selectively deposited on top of first conductive lines 218 only." Moreover, the first metal cap layer 220 differ significantly from a sense layer.

More specifically, the first metal cap layer 220 comprises one or more layers of W, Ti, TiN, Ta, TaN, TiW, Al, CoWP, CoP, or combinations of these. Ning does not teach electroless plating deposition of magnetic metals, such as PtMn, CoFe, Ru, and NiFe, which make up the bottom metal stack. Also, the first metal cap layer 220 is deposited to a thickness in the range of 10 to 150 nanometers. Ning does not disclose electroless plating deposition of layers, such as those in the bottom metal stack, which have thicknesses in the range of 400 Angstroms or less.

Further, the metal cap layer 220 is formed in a recess and is selectively deposited only on top of the first conductive lines. Ning discloses blanket deposition of the bottom metal stack layers followed by patterning and etching. Ning does not discuss formation of the plural, thin layers of magnetic metals making up the bottom metal stack in a recess, nor selective deposition of the thin layers of magnetic materials. Instead, the magnetic stack 222 is "patterned and etched to leave substantially square

portions of magnetic stack 222 in cross-point regions where the orthogonal conductive lines 218 and 228 intersect." See col. 7, lines 10-13 of Ning. Ning does not teach or suggest "an electroplated bottom sense layer."

Applicants also note that their invention differs from Ning by potentially increasing MRAM production yield. The bottom metal layers of the MRAM stacks are electrodeposited in openings formed in a dielectric layer. Consequently, the bottom metal layers do not require etching, and moreover are protected from being etched. Etching of bottom metal layers can reduce yield by causing the metal to sputter and short across upper layers of the MRAM stack. Instead, the inventive electroplated bottom layers are formed within the openings of a patterned dielectric. The patterned dielectric layer remains in place while the upper MRAM stack layers are deposited, patterned, and etched. The electroplated layer remains protected from sputtering and shorting the stack by the dielectric layer. Electroplating the bottom layer provides a structural advantage over Ning by eliminating stack shorts caused by sputtering, providing the potential for increased yield.

Claim 41 is patentable over Ning. Claims 42-46 depend directly from claim 41 and are patentable over Ning for at least the same reasons.

Claim 47 recites a processor-based system that includes, *inter alia*, "a processor," and "an integrated circuit coupled to said processor, said integrated circuit including a plurality of magnetic random access memory cells, each of said magnetic random access memory cells including an electroplated bottom layer over a planarized conductor."

Ning discloses an MRAM in which a substantially square magnetic stack is formed over a conductive line. Ning does not teach or suggest a processor-based

system that has MRAM cells "including an electroplated bottom sense layer over a planarized conductor."

The recitation of a bottom sense layer in claim 47 is the same as that in claim 41. Claim 47 is patentable over Ning for the same reasons as those advanced above with respect to claim 41. Claims 48-51 depend directly from claim 47 and are patentable over Ning for at least the same reasons.

Claims 52-60 are new. Claims 52-54 depend directly or indirectly from claim 41 and are patentable over Ning for at least the same reasons. In addition, claim 53 recites that the bottom sense layer extends longitudinally over the conductive line. Ning discloses patterned and etched stacks, and does not teach or suggest "a bottom sense layer that extends longitudinally over the conductive line." Claims 55-60 recite an electroplated bottom layer and are patentable over Ning.

In view of the above amendment and remarks, applicants believe the pending application is in condition for allowance.

Dated: September 20, 2005

Respectfully submitted,

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